

**WORLDWIDE EMERGING ENVIRONMENTAL ISSUES AFFECTING THE U.S. MILITARY**  
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**JULY–AUGUST 2008 REPORT**

Note to Readers: Pages 1-17 comprise the summary and analysis of this report. Expanded details for some items are in the Appendix beginning on page 18.

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## **Item 1. A New Step Toward Preventing Water Wars**

Falling water tables around the world increase the likelihood that abuse of international groundwater aquifers will cause conflicts. The International Law Commission adopted draft articles for the first international framework convention on transboundary groundwater aquifers. The articles cover issues related to utilization of transboundary aquifers; activities that have or are likely to have an impact on aquifers; and measures for the protection, preservation, and management of transboundary aquifers. The draft articles create a framework and set of principles for further negotiations to eventually create a binding convention. The articles are compatible with but independent from the UN Convention on the Non-Navigational Uses of International Watercourses (UN Watercourses Convention), and hence, not dependent upon its ratification. The UN Watercourses Convention was adopted in 1997 (with only China, Turkey, and Burundi voting against) and has 16 of the 35 required ratifications to go into force. At the 2008 World Water Week held in Stockholm, the WWF called upon states to support the Convention's entry into force as a way to prevent future possible conflicts due to competition over water resources.

### **Military Implications:**

Since the draft articles are likely to lead to the text of a future international convention, relevant military personnel should follow these negotiations to see how they could be used to help support the Army Strategy for the Environment, reduce the likelihood of water-related conflicts, and identify potential impacts on its operations.

### **Sources:**

International Law Commission Adopts Draft Articles of a Transboundary Aquifers Convention  
<http://www.asil.org/insights/2008/08/insights080827.html>

International Law Commission sixtieth session; summary of the session  
<http://untreaty.un.org/ilc/sessions/60/60sess.htm#summary>

World needs global water agreement now

[http://www.panda.org/news\\_facts/newsroom/press\\_releases/index.cfm?uNewsID=143643](http://www.panda.org/news_facts/newsroom/press_releases/index.cfm?uNewsID=143643)

2008 World Water Week Press releases

<http://www.worldwaterweek.org/press/index.asp>

WWF in 'water wars' warning

[http://www.inthenews.co.uk/news/wwf-in-water-wars-warning-\\$1236964.htm](http://www.inthenews.co.uk/news/wwf-in-water-wars-warning-$1236964.htm)

## **Item 2. East African Environmental Projects to Fight Crime and Link Journalists**

The Environmental Crime Project launched jointly by the Institute for Security Studies and Eastern Africa Police Chiefs Cooperation Organization has the mandate to develop mechanisms to improve environmental law enforcement and policy making in the East African region. The project will operate in Uganda, Kenya, Tanzania, Burundi, Rwanda, Seychelles, Ethiopia and Sudan, increasing protection against all forms of environmental crimes.

The new Network of Climate Journalists in the Greater Horn of Africa (NECJOGHA, [www.necjogha.org](http://www.necjogha.org)) represents an interactive resource for environment-related information and

communication in the region. The network is the result of collaboration among many international and national environment organizations, universities, and climate centers.

**Military Implications:**

AFRICOM and other relevant military components should seek cooperation with the ECP and to both help and use the NECJOGHA, offering support for increasing environmental protection in that highly vulnerable area in order to prevent and/or resolve conflicts related to environmental factors.

**Sources:**

Stakeholders Meeting and Launch of ISS-EAPCCO Environmental Crime Project

[http://www.issafrica.org/index.php?link\\_id=6299&link\\_type=12&tmpl\\_id=3](http://www.issafrica.org/index.php?link_id=6299&link_type=12&tmpl_id=3)

Launch of the Environmental Crime Project in Eastern Africa

<http://www.necjogha.org/node/86>

NECJOGHA

<http://www.necjogha.org>

**Item 3. Environmental Security Issues Discussed at the G8 in Japan**

Environmental security issues such as climate change, food crises, energy security and disaster reduction were the focus of the 34<sup>th</sup> G8 Summit held in Toyako, Hokkaido, July 7–9, 2008.

Although the Summit ended without an agreement on firm targets for reducing greenhouse gases, the final declaration stipulates a goal of at least 50% by 2050, with mid-term goals to be adopted by individual countries. This does not meet the suggestion made by the G5 countries (Mexico, Brazil, China, India and South Africa), which also attended the Summit, that developed countries' greenhouse gas reduction targets should be more than 80% by 2050 with an interim target of a 25-40% reduction by 2020. G8 leaders also agreed to implementing ambitious economy-wide mid-term GHG emission reduction goals, using sectoral approaches for achieving national emission objectives, conducting an energy forum to focus on efficiency and new technologies to be held in 2009 in Japan, and establishing the Climate Investment Funds to be administered by the World Bank to support the efforts of developing countries.

**Military Implications:**

Military personnel with international environmental security related responsibilities should review the G8 conclusions for opportunities for international cooperation, such as liaison with the World Bank's Climate Investment Future (e.g., military role in helping countries adapt to climate change), preparations for the energy forum (e.g., advanced energy-related technologies that could reduce GHG emissions per energy usage), and others.

**Sources:** (additional sources in the [Appendix](#))

G8 Hokkaido Toyako Summit

<http://www.g8summit.go.jp/eng/>

G8 statement on climate change and environment

<http://www.guardian.co.uk/environment/2008/jul/08/climatechange.carbonemissions/print>

## Item 4. Technological Advances with Environmental Security Implications

### 4.1 Nanotech Advances for Safer Environment

#### 4.1.1 Single-walled Carbon Nanotubes Give Support to Antimicrobial Enzyme

A team of researchers from the Samuel Ginn College of Engineering at Auburn University produced antimicrobial coatings that have the potential to prevent diseases from spreading on contaminated surfaces. They mixed a lysozyme solution with physically strengthening single-walled carbon nanotubes, and used layer-by-layer deposition to produce an inherently antimicrobial surface.

#### **Military Implications:**

The military should investigate the use of this technique in preventing the spread of harmful organisms in a contaminated environment. This technology might be useful against bio-weapons, and for disease control in medical and food services.

#### **Sources:**

Strong Antimicrobial Coatings: Single-Walled Carbon Nanotubes Armored with Biopolymers

<http://pubs.acs.org/cgi-bin/sample.cgi/nalefd/asap/html/nl080522t.html>

Super strong antimicrobial coatings for medicine, defense

<http://www.physorg.com/news134652009.html>

Engineering team recognized for breakthrough antimicrobial research

<http://www.eng.auburn.edu/admin/marketing/newsroom/2008/june/antimicrobial.html>

#### 4.1.2 Nanotube-based Coating Repels Water to Achieve Self-cleaning Surface

A research team led by Ayyappanpillai Ajayaghosh at the National Institute for Interdisciplinary Science and Technology in Trivandrum, India, developed a coating that produces surfaces so hydrophobic that a 2° slope causes water droplets to run off them, taking dust and other contaminants with them. The treatment is a dispersion of carbon nanotubes that coated with para-ethylene vinylene, a highly hydrophobic molecule.

#### **Military Implications:**

The military should follow this development to evaluate its ability to improve drivers' visibility and to reduce maintenance, and hence the training and operations environmental footprint.

#### **Source:**

Carbon Nanotubes with Nanoscopic Paraffin Coating Form Self-Cleaning Surfaces

<http://www.azonano.com/news.asp?newsID=6912>

### 4.2 New Detection and Cleanup Techniques

#### 4.2.1 Chemical Probe Offers Fast Detection of Ricin

A team of the Dept. of Chemistry and Biochemistry at the University of California at San Diego developed a fast-acting (30 minute) test for the presence of ricin-caused cell damage, based on inserting into RNA a synthetic nucleoside that glows under UV, when it is damaged by ricin. Previous tests, which detect the ricin protein itself, require 48 hours. The researchers anticipate that the technique can be implemented in a chip for use in the field.

**Military Implications:**

The military should follow this development for its applicability in a system for detecting the presence of ricin poisoning in an operational or terrorist attack environment.

**Source:**

Ricin's Deadly Action Revealed by Glowing Probes

<http://ucsdnews.ucsd.edu/newsrel/general/08-08RicinGlowingProbe.asp>

**4.2.2 Single-electron Transistors (SETs) and NEMS Make for New High-performance Sensor**

A team at the School of Electronics and Computer Science at the University of Southampton, England, part of the EU FP-7 NEMSIC project, is developing an extremely small, high-performance, low-power sensor in silicon which will have applications in biosensing and environmental monitoring. The device co-integrates single-electron transistors (SETs) and nano-electro-mechanical systems (NEMS) on a common silicon technology platform to produce the smallest sensor offered so far.

**Military Implications:**

The military should keep in touch with this program as its development transitions to practical application, and then assess the applications of such sensors in battlefield and environmental monitoring equipment.

**Source:**

World's Smallest, High-Performance and Low-Power Sensor in Silicon

<http://www.azonano.com/news.asp?newsID=6740>

**4.2.3 New Studies of Bacterial Oil Degradation in Contaminated Soil**

Two papers in the recent issue of the African Journal of Biotechnology report on studies, one in Nigeria and one in Kwazulu-Natal, of bacterial degradation of oil in contaminated soil. The latter research found five indigenous bacteria that degraded diesel by more than 85% within two weeks.

**Military Implications:**

The military should investigate these findings and any subsequent similar work for its applicability to cleanup of damaged environments.

**Sources:**

Degradation of diesel oil in a polluted soil using *Bacillus subtilis*

<http://www.academicjournals.org/AJB/PDF/pdf2008/17Jun/Nwaogu%20et%20al.pdf>

Isolation and characterization of diesel oil degrading indigenous microorganisms in Kwazulu-Natal, South Africa

<http://www.academicjournals.org/AJB/PDF/pdf2008/17Jun/Singh%20and%20Lin.pdf>

**4.2.4 Improved Technique for Removing Heavy Metals from Water**

Scientists of the Research Center for Eco-Environmental Sciences of the State Key Laboratory of Environmental Chemistry and Ecotoxicology, Chinese Academy of Sciences in Beijing, developed an improved technique for removing heavy metals from water. Fe<sub>3</sub>O<sub>4</sub> magnetic nanoparticles coated with humic acid are added to the water; they adsorb heavy metals, and are then removed with magnets. Their innovation is the use of the humic acid coating to prevent the particles from aggregating or oxidizing, while the acid itself combines with heavy metal ions.

**Military Implications:**

The military should follow up on this development for its potential usefulness in purification systems for water supplies in field environments and for contaminated site cleanup.

**Source:**

Applying nanotechnology to water treatment

<http://www.nanowerk.com/spotlight/spotid=6810.php>

**4.3 Increasing Energy Efficiency****4.3.1 New Catalysts Improve Hydrogen Generation Processes for Energy Storage**

Prof. Daniel Nocera of MIT announced development of a new electrolyzing technique that provides an efficient way to use electricity, as generated by solar panels or a wind farm, to split water into hydrogen and oxygen for storage and later use in a fuel cell. The technique is based on a novel cobalt/phosphate catalyst that allows the process to be carried out in an inexpensive non-specialized environment.

Similarly, scientists of Monash Univ. “have developed an efficient water oxidation catalyst, based on a manganese cubane cluster, which combines features of photosynthetic enzymes with the light harvesting power of dye-sensitized solar cells ... [and, paired] with a proton reducing catalytic cathode, ... have produced a photoelectrochemical cell that produces pure H<sub>2</sub> and O<sub>2</sub> from water and sunlight.”

Finally, Prof. Umit Ozkan, of Chemical & Biomolecular Engineering at Ohio State University, designed an inexpensive cerium-based catalyst that produces hydrogen from ethanol or other biofuels. This would allow conversion from liquid fuel to hydrogen to be done at the final fueling point.

**Military Implications:**

The military should follow these developments to assess their usefulness in power supplies for operational fuels and environmental sensing systems.

**Sources:**

'Major discovery' from MIT primed to unleash solar revolution

<http://web.mit.edu/newsoffice/2008/oxygen-0731.html>

Scientists learn from nature to split water

<http://www.physorg.com/news138179858.html>

Solar water splitting for renewable hydrogen production

<http://www.sync.monash.edu.au/absorption.html>

A better way to make hydrogen from biofuels

<http://www.physorg.com/news138450335.html>

**4.3.2 Integrated Monitoring/Control System Aids Buildings' Environmental Performance**

Agilewaves Inc. of Menlo Park, CA combined its Resource Monitor with a Crestron control system to produce a smart building system through which energy consumption can now be automatically tracked and controlled in real time. The Resource Monitor collects data from sensors placed in key areas, providing real-time information on resource consumption that can be broken down to specific floors, rooms, and appliances. It then alerts the Control System to act and keep energy consumption within limits by adjusting a thermostat, lights, water or blinds, for example.

**Military Implications:**

The military should investigate this integrated system for its applicability to environmental control of buildings on military installations.

**Source:**

Agilewaves Marries Monitoring and Control in New Smart System

<http://www.greenerbuildings.com/news/2008/07/28/agilewaves-marries-monitoring-and-control-new-smart-system>

**4.3.3 New Materials Provide Hope for Improved Ultra-capacitor**

EEStor, of Cedar Park TX, claims that its electrical energy storage unit will have more than three times the energy density of the top lithium-ion batteries today. The unit is based on a ceramic material consisting of a barium titanate powder coated with aluminum oxide and a type of glass material. Some experts have expressed doubts about the material's ability to withstand the high voltage gradients necessary to achieve the stated capacities, but others are more supportive.

**Military Implications:**

The military should follow this development as it progresses toward production status, and evaluate components based on it for applicability to energy storage for environmentally friendly and improved performance systems and vehicles.

**Source:**

Better Batteries Charge Up

<http://www.technologyreview.com/Energy/21171>

**4.3.4 New Scheme for Wireless Sensor Networks Improves Many Metrics**

Los Alamos National Laboratory computer scientist Sami Ayyorgun developed a new communications scheme for wireless sensor networks that improves a number of network performance measures, e.g., connectivity, energy, delay, throughput, system longevity, coverage, and security. The technique depends on each node's using a dynamically variable transmitting power, chosen according to an algorithm described in the paper.

**Military Implications:**

The military should investigate this technique for use in wireless networks of operational and environmental sensors.

**Sources:**

Towards a Self-organizing Stochastic-Communications Paradigm for Wireless Ad-hoc Networks  
Los Alamos National Laboratory, Los Alamos, NM 87545, USA (sami@lanl.gov)

Networks of the Future: Extending Our Senses into the Physical World

[http://www.lanl.gov/news/index.php/fuseaction/home.story/story\\_id/14183](http://www.lanl.gov/news/index.php/fuseaction/home.story/story_id/14183)

**Item 5. Updates on Previously Identified Issues****5.1 Biological Weapons Convention Meeting**

The Meeting of Experts from States parties to the Biological Weapons Convention (BWC) held in Geneva, August 18–22, 2008, is part of a four-year program to improve effectiveness of the

Convention. The focus of the meeting was increasing biosafety and biosecurity at international, regional, and national levels. The proposals included: improving awareness and education of scientists and policymakers; adopting and/or developing codes of conduct (especially for scientists who deal with biological materials); establishing international standards and external certification and audit mechanisms; increasing regional and international cooperation to improve biosafety and biosecurity methods; and organizing workshops for officials and scientists. [See also *Progress for Enforcing Biological Weapons Convention* in December 2007 and *Sixth Review Conference of the Biological Weapons Convention* in December 2006 and other related environmental security reports.]

### **Military Implications:**

[Similar to previous on the same issue] Without better international controls, terrorist access to biological weapons seems inevitable. Great progress has been made on bioweapons sensors over the past several years, some of which have been referenced in these monthly reports for AEPI. Relevant military personnel should consider making recommendations at the upcoming meetings.

### **Sources:**

Biological Weapons Convention Experts to Meet In Geneva from 18 To 22 August

[http://www.unog.ch/80256EDD006B9C2E/\(httpNewsByYear\\_en\)/623C880718912F67C12574A50040EA3F?OpenDocument](http://www.unog.ch/80256EDD006B9C2E/(httpNewsByYear_en)/623C880718912F67C12574A50040EA3F?OpenDocument)

The Inter Review Conference Meetings. 2008 Meeting of Experts: 18-22 August 2008

[http://www.opbw.org/new\\_process/mx2008/mx2008.htm](http://www.opbw.org/new_process/mx2008/mx2008.htm)

UN hosts summit on dangers of biological weapons

<http://www.mg.co.za/article/2008-08-18-un-hosts-summit-on-dangers-of-biological-weapons>

## **5.2 Increased Efforts Needed to Counter the Proliferation of Weapons of Mass Destruction**

The second report of the U.N. Security Council 1540 Committee concluded that although nations have made progress since the first report of the committee in April 2006, further measures are needed to completely carry out their obligations under the resolution intended to counter the proliferation of weapons of mass destruction. Information on all 192 U.N. nations was collected, out of which 155 provided reports on their 1540 implementation activities. The committee's recommendations include enhancing its own efforts, as well as improving collaboration with global and regional intergovernmental organizations to assist nations with the implementation process.

"It's Asia that has the most potent latent capabilities to develop nuclear, chemical and biological weapons," said Paul Dibb, professor at the Australian National University's Strategic and Defense Studies Center, at an Asian Pacific security forum. He also noted that groups such as the Association of Southeast Asian Nations and the Asia-Pacific Economic Cooperation forum have failed to establish effective nonproliferation arrangements, while Australia's Prime Minister Kevin Rudd's suggestion for an Asia Pacific Community to deal with security challenges in the region enjoys little enthusiasm. The mission of the new U.N. Regional Center for Peace and Disarmament in Asia and the Pacific, opened in Katmandu, Nepal, is to counter possible nuclear smuggling by terrorist and criminal groups in the region.

Meanwhile, the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction, initially supporting the program to secure and destroy WMD materials in Russia and Ukraine, agreed to expand their efforts to other countries (not yet specified). [See also *New*

*Concerns Rising over Chemical Weapons* in April 2007 and other related items in previous environmental security reports.]

**Military Implications:**

The status of current and potential weapons of mass destruction and weaponizable materials should constantly be reviewed in light of possible violations of the applicable international regulations and eventual updates of those regulations. Those with responsibilities in this area should consider assessing national and international opportunities for assisting in compliance and efficiency of the regulations, as well as strategies adapted to new geopolitical realities.

**Sources:**

Progress Has Been Made, but More Needs To Be Done To Implement Resolution 1540 in Full, United Nations Security Council 1540 Committee Concludes

<http://www.un.org/News/Press/docs/2008/sc9425.doc.htm>

Asian neighbours 'could go nuclear'

<http://www.news.com.au/story/0,23599,24213168-5007133,00.html>

G-8 Global Partnership: Adapting to New Realities

[http://www.partnershipforglobalsecurity.org/documents/Press\\_Release\\_G8GP\\_Final.pdf](http://www.partnershipforglobalsecurity.org/documents/Press_Release_G8GP_Final.pdf)

U.N. non-proliferation center in Nepal

[http://www.metimes.com/Security/2008/08/18/un\\_non-proliferation\\_center\\_in\\_nepal/2741/](http://www.metimes.com/Security/2008/08/18/un_non-proliferation_center_in_nepal/2741/)

**5.3 Support for Total Ban on Nuclear Weapons Increases**

Marking the 40th anniversary of the nuclear Non-Proliferation Treaty, on July 1, 2008, members of the European Parliament launched a Parliamentary declaration in support of the Nuclear Weapons Convention and a move towards total elimination of nuclear arsenals. Meantime, Australia established the International Commission on Nuclear Non-Proliferation and Disarmament, the Seven Nation Initiative for nuclear disarmament got revived, and both U.S. presidential candidates supported the vision of a nuclear weapons-free world. [See also *Australia to Propose Panel to Advance Work for the NPT Review in 2010* in June 2008, *Non-Proliferation Treaty Deadlock Continues* in May 2008 and other related items in previous environmental security reports.]

**Military Implications:**

The military should explore cooperation with these initiatives as an alternative way of facilitating the NPT negotiations to improve global nuclear safety.

**Sources:**

Members of the European Parliament launch support for a total ban on nuclear weapons:

Marking the 40th anniversary of the nuclear Non-Proliferation Treaty

[http://www.gs institute.org/pnnd/archives/07\\_01\\_08\\_PR\\_EP.html](http://www.gs institute.org/pnnd/archives/07_01_08_PR_EP.html)

International Commission on Nuclear Non-Proliferation and Disarmament

[http://www.pm.gov.au/media/Release/2008/media\\_release\\_0352.cfm](http://www.pm.gov.au/media/Release/2008/media_release_0352.cfm)

**5.4 Aviation to be included in the ETS from 2012**

The European Parliament adopted legislation to include aviation in the EU Emissions Trading System starting January 1, 2012. The regulation applies to all flights starting and/or landing in Europe (including intercontinental flights) by EU and non-EU airlines. Exceptions apply to: flights for humanitarian purposes under a UN mandate; emergency flights; police, customs and

military flights; research flights; and small airline companies producing low emissions. [See also *Provisional Agreement for Including Aviation in the Emission Trading Scheme from 2012* in June 2008 and other related items in previous environmental security reports.]

**Military Implications:**

Although military flights are exempted for now, the military should explore impacts on its European operations and contractors and be prepared to increase efforts for reducing emissions as much as possible.

**Sources:**

Aviation to be included in the European Trading System from 2012 as MEPs adopt legislation [http://www.europarl.europa.eu/news/expert/infopress\\_page/064-33577-189-07-28-911-20080707IPR33572-07-07-2008-2008-false/default\\_en.htm](http://www.europarl.europa.eu/news/expert/infopress_page/064-33577-189-07-28-911-20080707IPR33572-07-07-2008-2008-false/default_en.htm)

Aviation industry attacks EU emissions plan that effects airlines worldwide <http://euobserver.com/9/26511>

**5.5 The Debate over Strategic Control of the Arctic is Heating Up**

(A more detailed version of this summary is available in the [Appendix](#))

Both the Northwest and the Northeast Passages are ice-free for the first time in recorded history. This opens the possibility of shorter shipping distances via the Arctic, but increases concerns over security, environment, resource competition, and strategic control of the Arctic.

While multilateral negotiations are stalled, the Nordic countries continue to build their cases for territorial and security claims. Russia's claims over the Lomonosov Ridge conflict with those of Canada (supported by Denmark) and the US. There is a UN deadline for territorial claims in 2013. Canada is also doubling the 100 nautical miles off the coastline that it presently regulates and will make it mandatory for all ships entering its polar waters to report their presence. The claim includes the Northwest Passage, which no other country recognizes as a Canadian waterway. Greenland hopes that access to resources will help it gain its independence from Denmark. [See *Arctic Debate Update* in June 2008 and previous environmental security reports on this issue.]

Meantime, China sent its third expedition to the North Pole, saying its purposes are purely scientific, for studying climate change in the area and possible implications for China, rather than exploration of natural resources.

In view of the Arctic debate, the Durham University's International Boundaries Research Unit prepared a map and explanatory notes showing the region's current state of affairs and key disputed territories.

**Military Implications:**

[Similar to previous on the same issue] Negotiations for clear international regulations concerning the Arctic region should be accelerated, to counter any possible escalation of unfriendly attitudes. In any event, the likelihood of potential new military roles in the region increases, for both national security and protection of the ecosystems. Relevant military personnel should cooperate with their counterparts in other countries and international organizations in developing timely, adequate national and international regulations and enforcement procedures.

**Sources:** (more expanded list in the [Appendix](#))

Northeast and Northwest Passages Both Free of Ice

<http://www.spiegel.de/international/world/0,1518,574815,00.html>

PM pledges wider Arctic patrols

<http://www.theglobeandmail.com/servlet/story/LAC.20080828.ARCTIC28//TPStory/Environment>

Russia's Arctic ambitions challenged

[http://www.ft.com/cms/s/0/9d1a80e0-6c7d-11dd-96dc-0000779fd18c.html?nclick\\_check=1](http://www.ft.com/cms/s/0/9d1a80e0-6c7d-11dd-96dc-0000779fd18c.html?nclick_check=1)

The Race To Own The Top Of The World

<http://www.arcticoag.com/documents/press.html>

Chief scientist: China's North Pole trip focuses only on climate studies

<http://english.peopledaily.com.cn/90001/90781/90879/6449077.html>

Maritime jurisdiction and boundaries in the Arctic region (map)

<http://www.dur.ac.uk/ibru/resources/arctic/>

## **5.6 Climate Change**

### **5.6.1 Scientific Evidences**

The “Weather and Climate Extremes in a Changing Climate” report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research warns that extreme weather events such as the drought that hit this year in Atlanta, the heat-wave in New York, and the flooding of Des Moines are likely to increase in frequency across North America as the planet warms.

At the opening of the 11<sup>th</sup> International Coral Reef Symposium in Fort Lauderdale, attended by more than 2,500 scientists and government officials, NOAA revealed that nearly half of U.S. coral reef ecosystems are considered to be in “poor” or “fair” condition.

A “Position Analysis: CO<sub>2</sub> Emissions And Climate Change: Ocean Impacts And Adaptation Issues” by the Australian Antarctic Climate & Ecosystems Cooperative Research Centre suggest that oceanic acidification rose to the point that it should be considered in security strategies and longer-term national risk assessments. The analysis states that CO<sub>2</sub> in the atmosphere is at its highest level in 650,000 (possibly 23 million) years, and half has been dissolved in the oceans, increasing their acidity. Ocean acidification affects coral structures, marine life, and fisheries, potentially threatening the food security of millions in the Asia-Pacific, and presenting strategic and humanitarian challenges. As environmental threats for Pacific Island communities increase, so mount demands on Australia to assist countries facing environmental disasters.

### **5.6.2 Food and Water Security**

The food crisis continues to deteriorate. Malnutrition in India will get worse as the country may lose up to 17% of its farming income due to climate change. India and Cambodia are promoting the use of rat meat to offset the food crisis. Bangladesh might lose some 30% of its food production by 2050. The island of Mindanao in the Philippines may experience a food crisis as internal conflict forces displacement of many. Tropical storms in Haiti such as Fay worsen the food crisis, triggering new protests. UN agencies say that 50% of Somalia will be totally dependent on food aid and emergency assistance over the next year. UNICEF says that food shortage might affect up to 70% of rural population in the south, with one in six children suffering from acute malnutrition. South Africa might have its maize crop reduced by 20%

within 15 to 20 years as drought worsens in the west, while the east is increasingly afflicted by severe storms.

Three successive years of drought in the West Bank and restraint on movement brought some 50,000 Bedouins and herders to the brink of emergency, says the International Committee of the Red Cross, which helps them face an acute water shortage. This is aggravating Palestinian frustrations over the control of water resources in the Israeli-occupied West Bank. In Afghanistan, though, the food crises might help the government and international community efforts in encouraging the replacement of poppy crops with food crops, tackling both the drug trade and the food crisis.

Meantime, UNCTAD notes that while the world tends to address the urgent humanitarian aspects of global food crisis, attention should be focused on the structure of trade and development policy that underlies the crisis. Similarly, some analysis papers state that the world is producing enough to feed its population, but one of the major problems behind the food crisis is that as much as half of all food grown is lost or wasted (which means also wasted water). A policy brief, “Saving Water: From Field to Fork – Curbing Losses and Wastage in the Food Chain” produced by FAO, the International Water Management Institute, and the Stockholm International Water Institute, calls on all actors in society to reduce food waste by half, by 2025.

### 5.6.3 Melting Glaciers and Sea Ice

Experts at the World Water Week conference held in Stockholm warned of the rapid glacial melting and dramatic changes in rainfall in the world’s mountainous regions. Himalayan glaciers are retreating the most rapidly, said Mats Eriksson, of the International Centre for Integrated Mountain Development. Stretching across China, India, Nepal, Pakistan, Myanmar, Bhutan and Afghanistan, the Himalayas range constitutes a major source of water for some of the most populous parts of the planet.

Arctic Ocean sea ice might set another record low this summer, according to scientists at the National Snow and Ice Data Center, and to ESA’s Envisat satellite observations. The direct route through the Northwest Passage became almost free of ice, while the Amundsen Northwest Passage has been passable since July.

### 5.6.4 Rising Sea Levels

Sea levels could rise four meters, making some Pacific islands uninhabitable within the next decade, warns Australian expert Will Steffen, head of the climate change unit at the Australian National University and science adviser to the federal Government. Tuvalu might be underwater by 2050. He says that polar ice sheets melting have been underestimated.

West Africa’s 4,000-kilometre (2500-mile) coastline—from Senegal to Cameroon— might be dramatically changed by the end of the century due to rising sea levels of up to 2 cm (0.8 inches) per year that will damage fragile coastline strips, especially in low-lying and densely populated deltas. Among the cities worst hit would be the Gambian capital Banjul and Nigeria’s economic capital, Lagos, home to 15 million people.

Off the southern coast of Ghana, the ocean is rising steadily, forcing residents to move every few years. However, soon, some villages will have no place left to run, as the available properties are too expensive.

In Britain about 70 landmarks sites around the coastline are threatened by rising seas and coastal erosion, according to the National Trust.

### 5.6.5 Migration

Bangladesh is considered among the countries most vulnerable to rising sea levels as a one-meter rise in sea levels could wipe out 20% of its landmass, creating 30 million environmental refugees by 2050. However, based on 32 years of satellite images, scientists from the Dhaka-based Center for Environment and Geographic Information Services, say that Bangladesh's landmass has actually increased by 20 square kilometers (8 square miles) annually due to sediment carried down by the big Himalayan rivers—the Ganges and the Brahmaputra. Nevertheless, the highly populated coastal area remains vulnerable to climate change effects such as shorter but more severe monsoons, more violent tropical storms, longer periods of drought, and increased salinization, all impacting people's livelihoods.

### 5.6.6 Climate Modeling

The Center for a New American Security gathered some 40 climate scientists and experts in security, environmental policy, and business from Asia, Europe and the U.S. for a "war game" involving global warming. Four teams, representing China, Europe, India, and the U.S., had to negotiate the best deal for their team, in the case of a scenario set in 2015. The climate simulation up to 2100, based on the worst-case scenario proposed by the IPCC, was provided by the Oak Ridge National Laboratory in Tennessee. The three-day exercise confirmed the difficulties of such negotiations and might have pinpointed some specific aspects that should be considered in real situations.

The new NCAR Front Range Flash Flood Prediction System being tested by the National Center for Atmospheric Research (NCAR) in Boulder CO provides advance notice of potentially deadly flash floods. According to the announcement, the system integrates real-time weather information with datasets about hydrology and terrain. These datasets incorporate information about land surface conditions, such as terrain slope, soil composition and surface vegetation. They also include information on stream flow and channel conditions. The goal of the system is to furnish a 30-minute or longer warning of a flood.

New computer modeling shows that changes of the Atlantic Thermohaline Circulation (ATHC) due to melting glaciers and sea ice could influence the sea surface temperature changes in the Gulf of Guinea, thus possibly causing African Monsoon failures, resulting in up to 60% rainfall reduction and intensifying drought. The effect is estimated to be felt in less than a decade, with more drastic consequences predicted for the 25-35 years after the onset of increased freshwater additions to the ocean resulting in a rapidly weakened ATHC. The authors suggest monitoring the ATHC's changes and effects on the climate in the tropical Atlantic.

### 5.6.7 Post-Kyoto Negotiations

The third UN climate talks for a post-2012 treaty took place August 21-27 in Accra, Ghana, attended by about 1,600 delegates from some 160 nations. Progress was made on focus-issues such as strategies for slowing deforestation in developing nations, and considering a sectoral approach for greenhouse gas reduction targets. Rich countries insisted on a differentiation of approach and obligations of developing nations to greenhouse gas emissions based on their economic strength, pointing out that some developing nations such as Singapore, Argentina and some OPEC states have grown richer than some developed nations which have to comply with greenhouse gas emissions cut obligations. Rapidly industrializing countries have refused to accept the overall reduction targets that would be imposed on the rich nations, but progress was made in developing nations accepting targets for specific, highly polluting industries such as

cement, steel, and aluminum. The conclusions will be compiled for further discussion at COP 14 in December 2008, in Poznan, Poland.

Some nations outside the Kyoto framework want to set binding targets for emissions and act as a bridge between the developing and developed nations. For example, South Korea wants to announce in 2009 its 2020 greenhouse gases targets.

Japan announced plans to reduce total carbon emissions by up to 80% by 2050. In order to engage consumers in the “CO<sub>2</sub> reduction revolution,” carbon footprint labels will be put on most products’ packaging.

### **Military Implications:**

[Same as previous on similar issues] Increasingly more compelling evidence and warnings on climate change amplify international discourse and increase the emergence of international policies trying to tackle the causes and develop strategies to mitigate climate change effects. Hence, the military should be doing its part in reducing greenhouse gas emissions and preparing to help mitigate the human-made and natural catastrophes that could ensue.

**Sources:** (see a more expanded list in the [Appendix](#))

Weather and Climate Extremes in a Changing Climate

<http://www.climatescience.gov/Library/sap/sap3-3/final-report/default.htm>

No credit as oceans turn sour

<http://www.theaustralian.news.com.au/story/0,25197,23970127-11949,00.html>

UN agencies warns of worsening food crisis in Somalia

[http://news.xinhuanet.com/english/2008-08/23/content\\_9648262.htm](http://news.xinhuanet.com/english/2008-08/23/content_9648262.htm)

West Bank: ICRC helps Bedouins facing acute water shortage

<http://www.icrc.org/web/eng/siteeng0.nsf/html/israel-palestine-news-100708>

Pakistan food crisis unlikely to improve soon: WB meeting

<http://www.thenews.com.pk/print1.asp?id=131610>

Are we ready to deal with world food crisis?

<http://www.lankanewspapers.com/news/2008/8/31640.html>

UNCTAD says proper economic policies to solve global food crisis

<http://ippmedia.com/ipp/guardian/2008/08/23/121112.html>

Saving Water: From Field to Fork – Curbing Losses and Wastage in the Food Chain

[http://www.siwi.org/documents/Resources/Policy\\_Briefs/PB\\_From\\_Field\\_to\\_Fork\\_2008.pdf](http://www.siwi.org/documents/Resources/Policy_Briefs/PB_From_Field_to_Fork_2008.pdf)

Warming threatens crucial Himalayan water resources, forum told

<http://www.france24.com/en/20080821-warming-threatens-crucial-himalayan-water-resources-forum-told>

Climate Change in Action in Greenland

<http://www.time.com/time/health/article/0,8599,1829365,00.html>

Arctic ice on the verge of another all-time low

[http://www.esa.int/esaEO/SEMCKX0SAKF\\_planet\\_0.html](http://www.esa.int/esaEO/SEMCKX0SAKF_planet_0.html)

Australian expert says sea levels to rise four metres

<http://www.radioaustralia.net.au/news/stories/200808/s2340492.htm?tab=latest>

West Africa's coastline redrawn by climate change: experts

<http://www.terradaily.com/2007/080822173138.4whaxtau.html>

The threat of environmental refugees

<http://nation.ittefaq.com/issues/2008/08/24/news0708.htm>

Scientists Test System to Forecast Flash Floods along Colorado's Front Range

[http://www.nsf.gov/news/news\\_summ.jsp?cntn\\_id=111932&org=NSF&from=news](http://www.nsf.gov/news/news_summ.jsp?cntn_id=111932&org=NSF&from=news)

Climate war games. Role-play negotiations test the outcomes of global warming  
<http://www.nature.com/news/2008/080805/full/454673a.html> (by subscription only; full text in the [Appendix](#))  
 Melting polar ice-caps could bring more droughts to Africa  
<http://ec.europa.eu/environment/integration/research/newsalert/pdf/118na1.pdf>  
 Accra Climate Change Talks, 21-27 August 2008, Accra, Ghana  
<http://www.iisd.ca/climate/ccwg2/>  
 Japan to launch carbon footprint labelling scheme  
<http://www.guardian.co.uk/environment/2008/aug/20/carbonfootprints.carbonemissions>

### 5.7 Nanotechnology Safety Issues

More detailed descriptions of the following nanotechnology safety activities are available in the [Appendix](#)

The Euroscience Open Forum in Barcelona discussed the need for more research on the environmental risks posed by nanoparticles (e.g. nanoparticles from exhaust engines and air pollution, and lung cancers and heart disease; the asbestos-like properties of nanotubes). A German Federal Institute for Occupational Safety and Health study on the carcinogenicity of granular dusts found that 4 of the 16 dusts tested could be classified as nanoparticles, and overall, meet the EU criteria for a classification into category 2 of carcinogenic substances. Two new studies are assessing the impact of nanoparticles from diesel engine exhausts on human health. A new study shows that nanoparticles in sewage thought to be removed by biological purification could escape into bodies of water. The European Nanotechnology Conference in Switzerland in September will present nanotechnology commercial opportunities

#### Military Implications:

[Same as previous on this issue] Military personnel concerned with nanotech issues should contribute their views to these activities. Also, relevant military personnel should review the information generated by such activities to improve military and contractor practices, as well as to assist and cooperate with the organizations working on those issues to enrich their studies.

#### Sources:

Nanotech risk concerns 'must be addressed'  
[http://www.enn.com/top\\_stories/article/37738](http://www.enn.com/top_stories/article/37738)  
 Research on the carcinogenicity of nanoparticles and other dusts  
<http://www.nanowerk.com/news/newsid=6393.php>  
 Unregulated nanoparticles from diesel engines inhibit lungs  
<http://www.physorg.com/news138462352.html>  
 UK wins \$2 million EPA grant  
<http://www.kentucky.com/211/story/496040.html>  
 Nanoparticles In Sewage Could Escape Into Bodies Of Water  
<http://www.sciencedaily.com/releases/2008/07/080724221823.htm>  
 Meeting Place for Innovations  
[http://www.nanoeurope.com/wEnglisch/messen/nanoeurope/01\\_besucher/home/home.php](http://www.nanoeurope.com/wEnglisch/messen/nanoeurope/01_besucher/home/home.php)  
 Note: the following Websites provide continual updates on possible environmental and health implications of the nanotech:  
<http://epa.gov/oppt/nano/>  
<http://www.nanotechproject.org/inventories>  
<http://www.nanobusiness.org/index.php>

## Item 6. Reports and Other Sources Suggested for Review

### 6.1 Climate Change Impacts Assessment on U.S. National Security

*Assessment of Select Climate Change Impacts on U.S. National Security* by the Center for International Earth Science Information Network (CIESIN) of Columbia University is a paper in reaction to the *National Security Implications of Global Climate Change Through 2030* produced by the National Intelligence Council [see the respective item in the June 2008 environmental security report.] This extremely well-documented and illustrated paper identifies the countries at high potential security risk by examining and quantifying the security implications in three specific domains: global sea level rise, temperature change, and water scarcity. The aggregate vulnerability index takes into account a nation's respective climate change aspect and adaptability capacity. As to sea level rise, the most vulnerable are highly populated, low-elevation coastal zones in China, India, Indonesia, Philippines, and Egypt. The countries identified as presenting high instability risk due to temperature change are South Africa, Nepal, Morocco, Bangladesh, Tunisia, Paraguay, Yemen, Sudan and Côte d'Ivoire, while water scarcity might possibly increase instability in Mozambique, Côte d'Ivoire, Nigeria, Iraq, Guatemala, Zimbabwe, Ethiopia, Somalia, China, Syria and Algeria. The paper makes some recommendations on strategies and policies that might help overcome and mitigate eventual threats.

#### **Military Implications:**

The *Assessment of Select Climate Change Impacts on U.S. National Security* is an excellent resource for those involved in early warning of environmentally related conflicts.

#### **Sources:**

*Assessment of Select Climate Change Impacts on U.S. National Security*. Center for International Earth Science Information Network (CIESIN) Columbia University, July 1, 2008

[http://www.ciesin.columbia.edu/documents/Climate\\_Security\\_CIESIN\\_July\\_2008\\_v1\\_0.ed.pdf](http://www.ciesin.columbia.edu/documents/Climate_Security_CIESIN_July_2008_v1_0.ed.pdf)

Insecure environment

<http://www.canada.com/ottawacitizen/news/editorials/story.html?id=8959925b-ba08-4ee2-972e-93b5ddd4a789>

### 6.2 Environmental Refugees Cyberseminar

A cyberseminar on “Environmentally Induced Population Displacements” conducted August 18-29, 2008 by the Population-Environment Research Network in collaboration with the Environmental Change and Security Program of the Woodrow Wilson International Center for Scholars (<http://www.populationenvironmentresearch.org/seminars.jsp>) revealed the difficulty of defining environmental refugees. However, there were suggestions that the ongoing academic debate should be associated with more practical applications due to the urgency of the situation.

#### **Military Implications:**

Relevant military personnel should consider studying the cyberseminar papers due to the richness and comprehensiveness of information. Most probably, such academic debates are setting the stage for future policies and regulations concerning the growing number of environment-triggered displacements.

**Source:**

Environmentally Induced Population Displacements cyberseminar

<http://www.populationenvironmentresearch.org/seminars.jsp>

**6.3 Updated Studies on Potential Health Implications of Depleted Uranium**

Two recent studies by the Institute of Medicine address the possibility of assessing the potential health implications of exposure to depleted uranium: *Gulf War and Health: Updated Literature Review of Depleted Uranium*, and *Epidemiologic Studies of Veterans Exposed to Depleted Uranium: Feasibility and Design Issues*. Both studies conclude that health impacts of depleted uranium exposure in military and veteran populations are difficult to determine with the available data and procedures and an assessment plan would not be easy to design. However, the study on feasibility and design issues makes some recommendations for improving assessment of depleted uranium-related health outcomes, including “a prospective cohort study if future military operations involve exposure to depleted uranium” and better integration and linkages of DOD databases for identifying health issues of current active-duty military personnel and veterans with potential DU exposure. Both studies are pre-publications by the National Academies Press.

**Military Implications:**

Since the DU controversy continues, with pressure for creation of international regulations to ban DU munitions, the military should continue to seek alternative high-density projectile materials and glean force health protection recommendations from such studies.

**Sources:**

*Gulf War and Health: Updated Literature Review of Depleted Uranium*

[http://www.nap.edu/catalog.php?record\\_id=12183](http://www.nap.edu/catalog.php?record_id=12183)

*Epidemiologic Studies of Veterans Exposed to Depleted Uranium: Feasibility and Design Issues*

[http://www.nap.edu/catalog.php?record\\_id=12200](http://www.nap.edu/catalog.php?record_id=12200)

**6.4 Global Climate Risk Index 2008**

*Global Climate Risk Index 2008 Weather-Related Loss Events and Their Impacts on Countries In 2006 And In A Longterm Comparison* by Sven Harmeling analyzes to what extent countries and country groups have been affected by the impacts of weather-related loss events (storms, floods, heat waves etc.) whereby losses are quantified using four indicators: 1) total number of deaths; 2) deaths per 100,000 inhabitants; 3) absolute losses in million US\$ PPP (purchasing power parity; and 4) losses per unit GDP. These analyses are based on assessments of the Munich Re database NatCatSERVICE®. The Global Climate Risk Index 2008 was published by Germanwatch, an independent NGO, with financial support from the German Federal Ministry for Economic Cooperation and Development (BMZ).

**Military Implications:**

The Global Climate Risk Index might represent a good resource for assessing future possible conflict hot-spots due to climate change.

**Source:**

Global Climate Risk Index 2008

<http://www.germanwatch.org/klima/cr2008.pdf>

### **6.5 Social Networking Could Provide Tool for Military Environmental Activities**

Recent issues of USSTRATCOM's knowledge management publication *The Collaborator* have discussed the usefulness of social networking as an aid in many areas of military activity. Social networks allow personnel distributed worldwide to informally exchange ideas and experiences in solving all kinds of problems.

#### **Military Implications:**

Those involved in military environmental activities should consider the establishment of one or more social networks for the exchange of knowledge on matters of common interest.

#### **Sources:**

NASA Team Collaboration (Current issue)

<http://wiki.nasa.gov/cm/wiki/?id=3492>

NASA Team Collaboration Newsletter archive

[http://wiki.nasa.gov/cm/newui/wiki/forumlisting.jsp?projectname=Federal%20Knowledge%20Management%20Working%20Group%20\(KMWG\)](http://wiki.nasa.gov/cm/newui/wiki/forumlisting.jsp?projectname=Federal%20Knowledge%20Management%20Working%20Group%20(KMWG))

## APPENDIX

### Reference Details

This Appendix contains expanded background information on some items.

#### Item 3. Environmental Security Issues Discussed at the G8 in Japan

**Sources:** (a more expanded list)

G8 Hokkaido Toyako Summit

<http://www.g8summit.go.jp/eng/>

Inside Today's Bulletin. Security, Economy On G-8 Agenda

[http://www.thebulletin.us/site/index.cfm?newsid=19834312&BRD=2737&PAG=461&dept\\_id=576361&rfti=8](http://www.thebulletin.us/site/index.cfm?newsid=19834312&BRD=2737&PAG=461&dept_id=576361&rfti=8)

G8 statement on climate change and environment

<http://www.guardian.co.uk/environment/2008/jul/08/climatechange.carbonemissions/print>

G8 making climate change sales pitch to China

<http://www.canada.com/topics/news/story.html?id=564b804c-3982-45d5-913e-896cec0922fa>

Canada touts G8 statement as major breakthrough on climate change

[http://canadianpress.google.com/article/ALeqM5gCAmk-uLdpcKdbewMqCoU\\_CmoPgg](http://canadianpress.google.com/article/ALeqM5gCAmk-uLdpcKdbewMqCoU_CmoPgg)

G8 leaders face tough test

<http://www.thestar.com/News/Canada/article/455396>

Under tight security, G-8 leaders face expectations on climate, oil and Zimbabwe

<http://www.pr-inside.com/under-tight-security-g-8-leaders-face-r688258.htm>

President Barroso's press conference at the G8 Summit. Hokkaido, Japan, 8 July 2008

<http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/08/382&format=HTML&aged=0&language=EN&guiLanguage=en>

#### Item 5. Updates on Previously Identified Issues

##### 5.5 The Debate over Strategic Control of the Arctic is Heating Up

(A more expanded version)

This year, for the first time in known human history, both the Northwest and Northeast Passages are free of ice, opening the opportunity for the Arctic shortcut shipping route. Scientists estimate that by the summer of 2030, the Arctic might be completely ice-free for a few weeks. This increases concerns over security, environment, and resource-race issues, but, most of all, over the strategic control of the Arctic. While the multilateral negotiations are stalled, the Nordic countries continue to build their cases for territorial and security claims.

Canada is expanding by half a million square kilometers its Arctic Ocean territory—doubling the 100 nautical miles of the coastline that it presently regulates—and will make it mandatory for all ships entering its polar waters to report their presence. By the current regulations, registration with national authorities of ships in the Arctic is voluntary. “Canada takes responsibility for environmental protection and enforcement in our Arctic waters,” said

Prime Minister Stephen Harper. The claim includes the Northwest Passage, which no other country recognizes as a Canadian waterway. At a geology conference in Norway, Canada detailed its territorial claims to the Lomonosov Ridge, arguing that the ridge is part of the North American continent, not part of Siberia, as Russia has asserted. Canada's argument is supported by the Danish government, which also hopes to expand its part of the energy-rich ridge. Meantime, Greenland, encouraged by possible increased revenues from resource exploitations, hopes to become financially independent and therefore aspire to its own sovereignty. Meantime, a U.S. Coast Guard-led expedition was sent out on a mapping mission to determine the extent of the continental shelf north of Alaska and map the ocean floor. The data gathered could be used for oil and natural gas exploration. Margaret Hays, the director of the oceanic affairs office at the U.S. State Department, said the Alaskan continental shelf may lie up to 600 nautical miles from the coastline, far beyond the 200-mile economic exploitation zone. The UN deadline for territorial claims is 2013.

Meantime, China sent its third expedition to the North Pole, saying its purposes are purely scientific, for studying climate change in the area and possible implications for China, rather than exploration of natural resources.

In view of the Arctic debate, Durham University's International Boundaries Research Unit has prepared a map and explanatory notes showing the region's current state of affairs and key disputed territories. The map should help politicians and policy makers to understand areas of maritime jurisdiction as they engage in and try to settle sea territorial disputes.

As the ice recedes, new rules are needed to prevent "a rush to exploit all the available resources of the Arctic - another Klondike - and avoiding the destabilizing effects of massive infrastructure developments," said Jacqueline McGlade, executive director of the European Environment Agency.

#### **Sources:**

Northeast and Northwest Passages Both Free of Ice

<http://www.spiegel.de/international/world/0,1518,574815,00.html>

PM pledges wider Arctic patrols

<http://www.theglobeandmail.com/servlet/story/LAC.20080828.ARCTIC28/TPStory/Environment>

more than 200 cruise ships circled Greenland in 2007, up from 27 in 2004.

[http://www.nytimes.com/2008/08/17/world/europe/17arctic.html?\\_r=1&oref=slogin](http://www.nytimes.com/2008/08/17/world/europe/17arctic.html?_r=1&oref=slogin)

Rush to Arctic as warming opens oil deposits

<http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2008/08/12/MN5R1290QE.DTL&hw=Coile&sn=001&sc=1000>

Russia's Arctic ambitions challenged

[http://www.ft.com/cms/s/0/9d1a80e0-6c7d-11dd-96dc-0000779fd18c.html?nclick\\_check=1](http://www.ft.com/cms/s/0/9d1a80e0-6c7d-11dd-96dc-0000779fd18c.html?nclick_check=1)

A Push to Increase Icebreakers in the Arctic

[http://www.nytimes.com/2008/08/17/world/europe/17arctic.html?\\_r=1&oref=slogin](http://www.nytimes.com/2008/08/17/world/europe/17arctic.html?_r=1&oref=slogin)

Russia leads scramble for Arctic

<http://www.telegraph.co.uk/news/worldnews/europe/russia/2570295/Russia-leads-scramble-for-Arctic.html>

U.S. ship heads for Arctic to define territory

<http://www.reuters.com/article/topNews/idUSN1138192220080811?feedType=RSS&feedName=topNews&rpc=22&sp=true>

US mission to Arctic will lay claim to gas reserves

<http://www.telegraph.co.uk/news/worldnews/northamerica/usa/2549271/US-mission-to-Arctic-will-lay-claim-to-gas-reserves.html>

The Race To Own The Top Of The World

<http://www.arcticoag.com/documents/press.html>

Ice Free

[http://www.nytimes.com/2008/07/27/magazine/27wwln-phenom-t.html?\\_r=1&oref=slogin](http://www.nytimes.com/2008/07/27/magazine/27wwln-phenom-t.html?_r=1&oref=slogin)

Chief scientist: China's North Pole trip focuses only on climate studies

<http://english.peopledaily.com.cn/90001/90781/90879/6449077.html>

New map aims to help battle for Arctic territories

<http://www.reuters.com/article/environmentNews/idUSL562407320080806?sp=true>

Maritime jurisdiction and boundaries in the Arctic region (map)

<http://www.dur.ac.uk/ibru/resources/arctic/>

## 5.6 Climate Change

**Sources:** (a more expanded list)

### 5.6.1 Scientific Evidences

Weather and Climate Extremes in a Changing Climate

<http://www.climatescience.gov/Library/sap/sap3-3/final-report/default.htm>

Global Warming Chief Among Threats to Coral Reefs

<http://www.ens-newswire.com/ens/jul2008/2008-07-07-02.asp>

11th International Coral Reef Symposium

<http://www.nova.edu/ncri/11icrs/>

Position Analysis: CO<sub>2</sub> Emissions and Climate Change: Ocean Impacts and Adaptation Issues

<http://staff.acecrc.org.au/ace-notes/PA02acidification.pdf>

Media Release: call for action on ocean acidification

[http://www.acecrc.org.au/drawpage.cgi?pid=news&sid=news\\_media&aid=797643](http://www.acecrc.org.au/drawpage.cgi?pid=news&sid=news_media&aid=797643)

No credit as oceans turn sour

<http://www.theaustralian.news.com.au/story/0,25197,23970127-11949,00.html>

### 5.6.2 Food and Water Security

India may lose up to 17% of its farming income due to climate change

[http://economictimes.indiatimes.com/News/Economy/India\\_may\\_lose\\_up\\_to\\_17\\_of\\_its\\_farming\\_income\\_due\\_to\\_climate\\_change/articleshow/3371195.cms](http://economictimes.indiatimes.com/News/Economy/India_may_lose_up_to_17_of_its_farming_income_due_to_climate_change/articleshow/3371195.cms)

UN agencies warns of worsening food crisis in Somalia

[http://news.xinhuanet.com/english/2008-08/23/content\\_9648262.htm](http://news.xinhuanet.com/english/2008-08/23/content_9648262.htm)

West Bank: ICRC helps Bedouins facing acute water shortage

<http://www.icrc.org/web/eng/siteeng0.nsf/html/israel-palestine-news-100708>

West Bank struggles for water

[http://news.bbc.co.uk/go/em/fr/-/2/hi/middle\\_east/7571779.stm](http://news.bbc.co.uk/go/em/fr/-/2/hi/middle_east/7571779.stm)

Pakistan food crisis unlikely to improve soon: WB meeting

<http://www.thenews.com.pk/print1.asp?id=131610>

Are we ready to deal with world food crisis?

<http://www.lankanewspapers.com/news/2008/8/31640.html>

Climate change to hit SA crops

[http://www.int.iol.co.za/index.php?set\\_id=1&click\\_id=14&art\\_id=nw20080706152357245C555260](http://www.int.iol.co.za/index.php?set_id=1&click_id=14&art_id=nw20080706152357245C555260)

UNCTAD says proper economic policies to solve global food crisis

<http://ippmedia.com/ipp/guardian/2008/08/23/121112.html>

50 Percent of Food is Wasted Causing Water, Food and Hunger Crisis, Says SIWI, FAO and IWMI

<http://www.siwi.org/sa/node.asp?node=343>

Saving Water: From Field to Fork – Curbing Losses and Wastage in the Food Chain

[http://www.siwi.org/documents/Resources/Policy\\_Briefs/PB\\_From\\_Field\\_to\\_Fork\\_2008.pdf](http://www.siwi.org/documents/Resources/Policy_Briefs/PB_From_Field_to_Fork_2008.pdf)

Water and Sanitation Looms Behind Food, Energy and Climate Crisis, Concludes World Water Week 2008

<http://www.siwi.org/sa/node.asp?node=345>

### 5.6.3 Melting Glaciers and Sea Ice

Warming threatens crucial Himalayan water resources, forum told

<http://www.france24.com/en/20080821-warming-threatens-crucial-himalayan-water-resources-forum-told>

Climate Change in Action in Greenland

<http://www.time.com/time/health/article/0,8599,1829365,00.html>

Arctic Sea Ice News 2008

<http://nsidc.org/arcticseaicenews/index.html>

Arctic ice on the verge of another all-time low

[http://www.esa.int/esaEO/SEMCKX0SAKF\\_planet\\_0.html](http://www.esa.int/esaEO/SEMCKX0SAKF_planet_0.html)

### 5.6.4 Rising Sea Levels

Australian expert says sea levels to rise four metres

<http://www.radioaustralia.net.au/news/stories/200808/s2340492.htm?tab=latest>

West Africa's coastline redrawn by climate change: experts

<http://www.terradaily.com/2007/080822173138.4whaxtau.html>

Rising sea buries village

<http://www.iht.com/articles/ap/2008/08/26/africa/AF-Village-Under-Sea.php>

Beauty spots to be devoured by sea

<http://www.guardian.co.uk/environment/2008/aug/24/endangeredhabitats.conservati1>

### 5.6.5 Migration

The threat of environmental refugees

<http://nation.ittefaq.com/issues/2008/08/24/news0708.htm>

Bangladesh gaining land, not losing: scientists

<http://www.france24.com/en/20080730-bangladesh-gaining-land-not-losing-scientists>

### 5.6.6 Climate Modeling

Climate war games. Role-play negotiations test the outcomes of global warming

<http://www.nature.com/news/2008/080805/full/454673a.html> (by subscription only; full text below)

Scientists Test System to Forecast Flash Floods along Colorado's Front Range

[http://www.nsf.gov/news/news\\_summ.jsp?cntn\\_id=111932&org=NSF&from=news](http://www.nsf.gov/news/news_summ.jsp?cntn_id=111932&org=NSF&from=news)

Melting polar ice-caps could bring more droughts to Africa

<http://ec.europa.eu/environment/integration/research/newsalert/pdf/118na1.pdf>

### 5.6.7 Post-Kyoto Negotiations

Accra Climate Change Talks, 21-27 August 2008, Accra, Ghana

<http://www.iisd.ca/climate/ccwg2/>

UN Climate Talks Split Over Deforestation Funds

<http://www.planetark.com/dailynewsstory.cfm/newsid/49919/story.htm>

UN climate talks to seek speed amid discord

<http://www.planet2025news.net/ntext.rxml?id=20330&photo=>

New CO2 emissions treaty is imminent

<http://www.independent.co.uk/environment/climate-change/new-co2-emissions-treaty-is-imminent-907305.html>

Rich Urged to Set Deep Climate Cuts, Without US

<http://www.planetark.org/dailynewsstory.cfm/newsid/49846/story.htm>

U.N. climate talks seek quicker pace

<http://uk.reuters.com/article/environmentNews/idUKLJ46600720080820?sp=true>

Rich or Poor? New Faultline in UN Climate Talks

<http://www.planetark.org/dailynewsstory.cfm/newsid/50006/story.htm>

Japan to launch carbon footprint labelling scheme

<http://www.guardian.co.uk/environment/2008/aug/20/carbonfootprints.carbonemissions>

## **5.7 Nanotechnology Safety Issues**

### 5.7.1 Nanoparticle Warnings at Euroscience Open Forum

Two speakers at the Euroscience Open Forum in Barcelona discussed the need for more research on the environmental risks posed by nanoparticles. Hermann Stamm, head of nanotechnology and molecular imaging at the Institute for Health and Consumer Protection in the European Commission's Joint Research Council brought up concerns about a connection between nanoparticles from exhaust engines and air pollution, and lung cancers and heart disease. Ken Donaldson, of Queens' Medical Research Institute, Scotland, reported on his work on the asbestos-like properties of nanotubes. (See this report for May, 2008, Item 8.10)

#### **Military Implications:**

These talks are likely to increase the pressure for greatly increased research on nanotech risk assessment and for stricter controls on those substances.

#### **Source:**

Nanotech risk concerns 'must be addressed'

[http://www.enn.com/top\\_stories/article/37738](http://www.enn.com/top_stories/article/37738)

### 5.7.2 New Study on the Carcinogenicity of Nanoparticles and Other Dusts

According to Nanowerk.com, the German Federal Institute for Occupational Safety and Health has released a study whose aims were to analyze differences between the carcinogenicity of granular dusts in the rat lung after intratracheal instillation, to find out the optimal dose metric for their carcinogenic potency, and to interpret their potential relevance for human health. Four of the 16 dusts tested could be classified as nanoparticles. The conclusion was that, overall, the state of knowledge meets the EU criteria for a classification of most of the particles into category 2 of carcinogenic substances.

#### **Military Implications:**

The military should review this work and follow its continuation, to assess its further relevance to nanotech risk assessment.

#### **Source:**

Research on the carcinogenicity of nanoparticles and other dusts  
<http://www.nanowerk.com/news/newsid=6393.php>

### 5.7.3 Diesel Exhausts Emit Nanoparticles Affecting Lung Function

According to a news release, Prof. Angela Violi, of the Univ. of Michigan College of Engineering, is presenting a simulation paper to the American Chemical Society that predicts that nanoparticles from diesel engine exhausts “can get trapped in the lungs and inhibit the function of a fluid [a surfactant] that facilitates breathing”. Also the EPA has awarded a grant to a team of researchers led by Prof. Robert Yokel, of the College of Pharmacy at the Univ. of Kentucky, to define the basic properties of nanoparticles of cerium oxide, a diesel fuel additive used in Europe. According to an announcement, the research will define the basic properties of the particles and examine how they are absorbed by the body.

#### **Military Implications:**

Nano-sized particles are not covered by current pollution regulations, but these results may very well later change that situation. The military should review its use of diesel engines and plan for the possibility of future regulations affecting them.

#### **Sources:**

Unregulated nanoparticles from diesel engines inhibit lungs

<http://www.physorg.com/news138462352.html>

UK wins \$2 million EPA grant

<http://www.kentucky.com/211/story/496040.html>

### 5.7.4 New Study Shows Nanoparticles In Sewage Could Escape Into Bodies Of Water

Researchers at ETH Zurich, the University of Applied Sciences Wädenswil, and BMG Engineering AG, led by Prof. Wendelin Stark, have shown that a portion of nanoparticles of cerium dioxide in industrial sewage, previously thought to be removed by biological purification or trapped in sewage sludge, can remain in the effluent and can leave the sewage works practically unchanged. According to the news story, what happens to the particles after a sewage plant has scarcely been researched up to now.

**Military Implications:**

Previous risk assessment studies of nanoparticles in sewage should be reviewed to see if their results need modification because of this new work.

**Source:**

Nanoparticles In Sewage Could Escape Into Bodies Of Water

<http://www.sciencedaily.com/releases/2008/07/080724221823.htm>

5.7.5 European Nanotechnology Conference in Switzerland in September

NanoEurope, a European exhibition for the transfer of nanotechnology knowledge, will be held in St.Gallen, Switzerland 16-17 September 2008. According to the announcement, it “will present successful commercial nanotechnology applications and introduce new scientific knowledge that can be commercialized”, and will also feature a business exposition.

**Military Implications:**

Military personnel in the European Theater who are concerned with nanotech developments should consider attending this event.

**Source:**

Meeting Place for Innovations

[http://www.nanoeurope.com/wEnglisch/messen/nanoeurope/01\\_besucher/home/home.php](http://www.nanoeurope.com/wEnglisch/messen/nanoeurope/01_besucher/home/home.php)

5.7.6 Web Sites Provide Continual Updating

Military personnel concerned with nanotech risk assessment should monitor these major government (EPA), NGO, and business Web sites for continuing developments in the field:

<http://epa.gov/oppt/nano/>

<http://www.nanotechproject.org/inventories>

<http://www.nanobusiness.org/index.php>

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**Climate war games**

Role-play negotiations test the outcomes of global warming.

Nature, 5 August 2008, doi:10.1038/454673a

<http://www.nature.com/news/2008/080805/full/454673a.html> (by subscription only)

Text reproduced from Climate Ark

<http://www.climateark.org/shared/reader/welcome.aspx?linkid=104313&keybold=greenhouse%20gas%20reduction%20states>

More than 40 negotiators from Asia, Europe and the United States converged on Washington DC last week for what was billed as the first major war game involving global warming.

The Center for a New American Security, a Washington-based national security think tank, gathered together climate scientists and experts in security, environmental policy and business for the role-playing exercise. Each was assigned to one of four teams, representing Europe, the United States, China and India, and charged with negotiating the best deal for their team.

Under the scenario, set in 2015, greenhouse-gas emissions are rising, and the latest climate models paint a grim picture of the future if business were to continue as usual. Extreme weather, including droughts, storms and floods, is on the rise. The United Nations is calling for international cooperation on emissions reductions, adaptation, disaster relief and shortages of crucial resources such as food and water.

Conference organizers worked with scientists at Oak Ridge National Laboratory in Tennessee who provided a climate simulation up to 2100 based on the worst-case scenario proposed by the Intergovernmental Panel on Climate Change. This scenario mixes rapid growth with continued reliance on fossil fuels — something the organizers say is reasonable, given that emissions are currently trending higher than projected.

After lengthy negotiations, the United States and the European Union agreed to a 30% reduction in emissions by 2025. They also agreed to finance a portion of the emissions reductions by the developing world. But China refused to accept any specific emissions targets. India committed itself to reductions, but only with a number of contingencies. In a sad mirror of reality, the participants departed after three days without the comprehensive agreement many had been hoping for.

“If it were easy it wouldn’t be realistic, because these are not easy issues,” says Reid Detchon, a US team member and executive director for energy and climate at the United Nations Foundation in Washington DC. Detchon credits the exercise with “exposing some of the tensions” in the debate — particularly on the China team, which included members from China.

“I was just struck by the enormity of the challenge before us,” says Todd Stern, a partner with the law firm WilmerHale based in Washington DC and a senior negotiator under US President Bill Clinton during negotiations on the Kyoto Protocol. “The notion of large reductions from the Chinese perspective seems absolutely undoable.”

War-game organizers say the exercise was intended to engage people with the science and with potential solutions, and to make them test their assumptions in a dynamic situation. From this perspective, they say, the process can be illuminating even if the results are of limited value.

Most participants agree, although Eileen Claussen, president of the Pew Center on Global Climate Change in Arlington, Virginia, says the negotiations, although intense, were not at all representative of what one might expect from India and China in the forthcoming United Nations talks. India would be unlikely to agree so quickly to an emissions-reduction proposal, she says, and China would be unlikely to come to the table empty-handed.

And as a veteran in this arena whose experience in real treaty negotiations dates back to the Montreal Protocol on ozone-depleting gases two decades ago, Claussen says her participation was geared more towards educating others. “My guess is many people learned something from this, but for me it was community service,” she says.

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